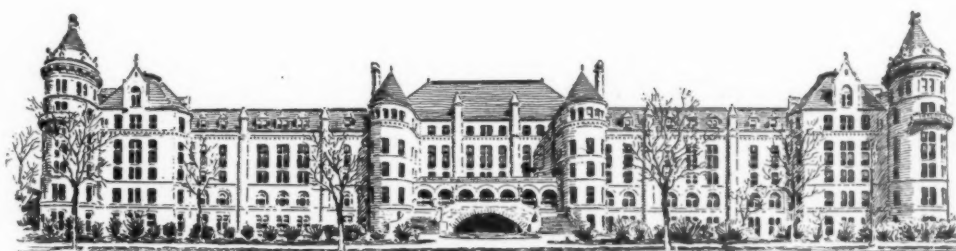


Volume II, Number 1

JANUARY, 1902

THE
AMERICAN MUSEUM
JOURNAL



WITH SUPPLEMENTARY GUIDE LEAFLET ON
THE HALL OF FOSSIL VERTEBRATES

Published by the AMERICAN MUSEUM OF NATURAL HISTORY
New York City

American Museum of Natural History

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THE AMERICAN MUSEUM OF NATURAL HISTORY was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people, and it is in cordial coöperation with all similar institutions throughout the world. Since the Museum authorities are dependent upon private subscriptions and the dues from its members for procuring needed additions to its collections and for carrying on explorations in America and other parts of the world, the attention of persons interested in such matters is called to the brief statement of deeds and needs on the fourth page of the cover of the Supplement.

The American Museum Journal

VOL. II.

JANUARY, 1902

No. 1.



THE present number of the JOURNAL, commencing Volume II, inaugurates certain changes in typography and page which it is hoped will prove acceptable to our readers and to those who make use of the supplements. The plan which was adopted with the number for October last of issuing a supplementary guide leaflet to an exhibit or group of exhibits in the Museum has met with so much favor that it will be continued for the present. The supplement issued with the current number is a general description of the material on exhibition in and of the arrangement of the hall of Vertebrate Palæontology. It is proposed to prepare several similar illustrated leaflets describing at some length and in a popular manner different portions of the exhibit in this hall which may be considered as units. The authorities of the Museum are issuing the JOURNAL as a means of bringing the institution into close touch with the public and the schools, and it is to be hoped that the friends of the Museum will assist in making the circulation of the publication as large as possible. The JOURNAL proper will continue to give to the public items of news regarding the work of the various departments, notable new accessions, programs of lectures and popular short articles on specimens in the Museum. The price of subscription to those not members of the institution has been placed at the low price of one dollar per year, which barely covers the actual cost of paper, illustrations, printing and postage.

The Department of Geology has just completed a large undertaking, namely, the publication of a tabulated catalogue of all the type and figured specimens contained in its extensive collection of fossils. The term "type", as employed in this Department of the Museum, embraces not only the specimens actually

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used by an author in the original description of a species, but also those specimens which have been used by the same author in the further elucidation of the species in subsequent publications. The types may or may not have been illustrated in connection with the first publication. "Figured specimen" is the term applied here to the specimens which have been identified with a species by another person than the author of the species and which have been illustrated in some publication. From the standpoint of the student and investigator, such specimens are the most valuable portion of any collection, and should, therefore, be marked in some conspicuous manner and be preserved with the greatest care, while the knowledge of their location and their history should be as widely disseminated as possible. All the types and figured specimens in this Department are individualized by the use of a small rhomb of emerald green paper securely gummed to each.

There are in this Department of the Museum 8,345 type and figured specimens, representing 2,721 species and 190 varieties, distributed in the Catalogue according to the following table:

PARTS.	TYPES.			FIG'D SPECIMENS.			REFERENCES.	
	Species.	Varieties.	Specimens.	Species.	Varieties.	Specimens.	Page.	Figure.
I.....	448	10	1070	16	107	450	836	2372
II.....	635	22	1791	92	0	625	1236	4504
III.....	667	27	1707	158	5	717	3329	5437
IV.....	472	12	1598	233	7	387	1160	2011
Totals.....	2222	71	6166	499	119	2179	6561	14324

Part I, issued in July, 1898, embraces the specimens in the Cambrian and Lower Silurian systems; Part II, issued in October, 1899, includes the material from the Upper Silurian system;

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Part III, issued in October, 1900, comprises that from the Devonian system; and Part IV, bearing date of December 27, 1901, lists the remainder of the collection from Lower Carboniferous to Quaternary, inclusive, and contains the preface, table of contents and index to the whole work.

ANTHROPOLOGICAL WORK AMONG THE INDIAN TRIBES OF THE SOUTHWEST.



IN January 1 Dr. Aleš Hrdlička, of the Department of Anthropology, started on his fourth expedition for this Museum to the region of the Aztecs, Pueblos and Cliff-Dwellers, and he expects to return in about eight months.

These expeditions have had for their object the systematic study of the physical characteristics of all the Aztec, Pueblo and Cliff-Dweller tribes, living or extinct, from southern Utah and southern Colorado down to the state of Morelos, Mexico. Among other results which may be expected are the definite identification of these tribes and either a refutation or a confirmation of the theory that the Aztecs came from the north and were probably related to the Pueblos. Physiological observations are also made for a comparison of some of the principal functions of the body, such as pulse, temperature, respiration and muscular force, in these tribes and in white men. Medical observations are made on the ordinary diseases among the Indians and on their manner of treating them.

Dr. Hrdlička's previous expeditions in this series have been as follows: first, in Mexico, in 1898, with Dr. Carl Lumholtz, covering the Tarahumares, Huichols and Tepecanos; second, in 1899, to the Navahos and southern Utes; third, in 1900, to all the Pueblos and Apaches. The present expedition will cover the remaining tribes in southwestern Arizona and northern Mexico, among them the Bimas, Papagos, Yaquis, Mayos, Tepehuanes, Coras, Aztecs and Tarascos. The first expedition was supported by the Museum; the second, third and fourth by Mr. Frederick E. Hyde, Jr.

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NEW BIRD GROUPS.



THROUGH the generosity of a friend of the Museum, who desires to have his name withheld from the public, six groups have recently been added to the very attractive and instructive series representing birds amid their natural surroundings which are to be seen in the halls of the Ornithological Department. The new groups represent the American dipper, or water-ousel, the osprey, the yellow-headed blackbird, the coot, Wilson's phalarope and the wild pigeon. The material for the first-named was gathered by Mr. Frank M. Chapman last summer on the banks of a rushing icy stream issuing from a glacier in the Selkirk mountains of British Columbia. The rocky bank of the stream, the nest in the cleft of the rock and the birds in and about the nest have been reproduced with lifelike fidelity in the Museum exhibition case. Mr. Chapman collected the specimens and accessories for the osprey group on Gardiner's Island, off the eastern end of Long Island, and those for the blackbird, coot and phalarope groups at Shoal Lake, Manitoba. The twelve specimens included in the wild-pigeon group were secured with much difficulty from collectors and dealers throughout the country, the surprising fact being incidentally developed that a species which, within the last fifty years, was one of the most abundant native birds of this country, is now so rare, not only in nature, but also in collections, that specimens of it are practically unobtainable. Each of these new groups is designed to illustrate not only the haunts and habits of a species of birds, but also some fact of general biological interest. This feature will be fully set forth in the labels accompanying the cases.

NOTES AND NEWS.

DEPARTMENT OF ENTOMOLOGY.—Mr. William Beutenmüller, the Curator of this Department of the Museum, again visited the Black mountains of western North Carolina during September and October last for the purpose of securing specimens of the insects occurring in this interesting region and of obtaining

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scientific data regarding their surroundings and life-histories. The results of the expedition are highly satisfactory and demonstrate the desirability of carrying the work on to completion. About 3500 specimens were collected on this trip, supplementing the 3000 which were obtained in the same region last year. The insect fauna of the mountainous region of western North Carolina is very distinct from that of the surrounding country, and many of the species show northern affinities. Mr. Beutenmüller obtained on this trip many new as well as many very rare species, and he has in preparation a monograph on "The Insect Fauna of the Black Mountains, North Carolina," which it is to be hoped he will be enabled to bring to satisfactory completion by material to be obtained on future expeditions. The Black mountains are a transverse chain forming the principal link of connection between the Blue Ridge and the Smoky mountains, and rise in a region which is very interesting from a geographical and geological as well as from a faunal standpoint. It is the culminating portion of the Appalachian system, the united chains containing, in the district under consideration, twenty-five great peaks, twenty of which are more than 6000 feet in elevation above the sea. Most of these mountains are practically unexplored territory, which furnishes an additional argument for the speedy completion of this entomological survey of it.

THE Department of Anthropology has received the first installment of Chinese clothing, baskets and tools used by the tailor and artificers in allied trades, collected by Dr. Berthold Laufer on his expedition to China, recently undertaken through the generosity of a friend of the Museum. The most striking feature of the consignment just received is the clothing, which represents completely the costumes of various classes of the people and includes a number of magnificently embroidered garments. A portion of this Chinese collection is on exhibition in hall No. 106, on the ground-floor of the building.

IN the same hall (No. 106) will be found the famous Briggs collection, representing the basketry of the Indians of the Pacific coast of the United States, which has been recently received as a

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donation from George F. Peabody, Esq. This collection is particularly good in the line of feathered baskets from central California and other kinds from the southern part of that State.

THE Museum has received from Mr. W. Jochelson, of the Jesup North Pacific Expedition, his whole Koryak collection from Siberia, consisting of about 1200 pieces of all sorts, among which there are a great many objects of prehistoric age. This material and that sent in by Mr. W. Bogoras, of the same expedition, which was noticed in the last number of the JOURNAL, have been removed from the original boxes in which they were received and have been placed in storage cases for lack of room in the exhibition halls for displaying them.

ARTHUR CURTISS JAMES, Esq., has purchased the valuable collection of Ainu objects made by Professor Bashford Dean last year and has presented it to the Museum. This latest addition supplements in a very satisfactory manner the two Ainu collections previously owned by the Museum and renders the whole series a very complete representation of the culture of that peculiar people. One of the older Ainu collections was presented by Mr. James, while the other was obtained by Dr. Laufer in 1899, when at work for the Jesup North Pacific Expedition.

MR. MARSHALL H. SAVILLE, Curator of the Section of Mexican Archæology of the Anthropological Department, left New York on December 11 to continue the explorations at the ancient ruined city of Mitla, in the State of Oaxaca, Mexico, which he has been prosecuting with great success for some years with the aid of funds provided by the Duke of Loubat.

THERE has just been erected in the opening of the west stairway an immense totem pole from Queen Charlotte's Island, British Columbia. This fine pole, which is nearly fifty feet tall, stood for many years near the Indian village of Gumshewa on the east coast of the island and was brought to the Museum in 1901 as a result of the Jesup North Pacific expedition.

AN index to Volume I of the JOURNAL is in course of preparation and will be issued as soon as practicable.

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LECTURES.

PROFESSOR ALBERT S. BICKMORE, Curator of the Department of Public Instruction, announces the following courses of lectures for the remainder of the season of 1901-1902.

To Teachers in the Public Schools, Saturday mornings at 10:30 o'clock:

January 25th and February 1st.—"Naples, Pompeii and Rome: Their Museums."

February 8th and 15th.—"The Eastern Riviera."

March 1st and 8th.—"The Upper Rhine."

March 15th and 22d.—"The Lower Rhine."

To the Members of the Museum and their friends, on Thursday evenings, as usual, at 8:15 o'clock:

February 20th.—"Naples, Pompeii and Rome: Their Museums."

February 27th.—"The Eastern Riviera."

March 6th.—"The Upper Rhine."

March 13th.—"The Lower Rhine."

On Thanksgiving Day Professor Bickmore repeated his lecture on the Pan-American Exposition of 1901 to the general public. This lecture has been given five times in the Museum, beginning with October 26th, and the record of attendance shows that 4,944 persons have heard it, the doors of the lecture hall being closed when all the seats were occupied.

On Christmas Day Professor Bickmore lectured in the Museum to the general public on "London: The 'City' and the Thames," while on New Year's Day he had "London: Its Museums and Galleries" for his subject. On Washington's Birthday he will give an illustrated lecture on "The Rhine" to the public. No tickets are required for admittance to these lectures on the legal holidays, but the number in the audience is limited to the seating capacity of the hall.

BOARD OF EDUCATION COURSE.—The programme of illustrated lectures at the Museum during January and February under the auspices of the city Department of Education provides for lectures twice a week, continuing the plan inaugurated in

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October last. The lecturers and subjects for the Tuesday evening course are as follows:

January 7th.—W. E. MEEHAN,—“Greenland.”

January 14th.—MISS MARY V. WORSTELL,—“The Yellowstone National Park.”

January 21st.—EGERTON R. YOUNG,—“The Indians of the Wild Northwest: Their Haunts; Their Sports; Their Homes.”

January 28th.—F. S. DELLENBAUGH,—“The Cliff- and Cave-Dwellers of the Southwest.”

February 4th.—W. C. PECKHAM,—“The State of New York, and its Remarkable Natural Features.”

February 11th.—GEORGE W. BICKNELL,—“Flashes of Light on Yankee Land.” A description of Central New England.

February 18th.—JACQUES W. REDWAY,—“In the Heart of the Rockies.”

February 25th.—E. O. HOVEY,—“The Black Hills and Bad Lands of South Dakota and Wyoming.”

The programme of the course for Saturday evenings is as follows:

January 4th.—HARLAN I. SMITH,—“An Evening in the American Museum of Natural History.”

January 11th.—CHAS. L. BRISTOL,—“The New York Aquarium.” A description of the fine fish collection at the Battery.

January 18th.—MISS MARY V. WORSTELL,—“Bronx Park.” A description of the Park and the New York Botanical Gardens.

January 25th.—HENRY F. OSBORN,—“The Zoölogical Garden.” A description of New York's great Zoölogical Garden at Bronx Park.

February 1st.—W. T. ELSING,—“The Reign of Fire.” The first of a course of four lectures on “The Story of the Earth.”

February 8th.—W. T. ELSING,—“The Warfare of Water.”

February 15th.—W. T. ELSING,—“The Great Ice Age.”

February 22d.—W. T. ELSING,—“The Earth and Man.”

At the Board of Education lectures, given at the Museum during October, November and December, the official total attendance at the Tuesday evening course of eleven lectures was 15,924, and at the Saturday evening course of nine lectures, 5,409. The Saturday evening lectures were more technical in character than were those given on Tuesday evenings. The lecture on the Passion Play, October 22d, was heard by a thousand people more than could obtain seats in the hall.

Publications
OF THE
American Museum of Natural History

ANNUAL REPORT: Octavo, about 80 pp.

BULLETIN: Octavo; annual; about 400 pages and 25 plates with numerous text illustrations. Articles relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology and (in recent volumes) Anthropology.

MEMOIRS: Quarto; issued in parts at irregular intervals, several parts being published annually. One volume has been completed and six are now under way. Each part forms a separate and complete monograph, varying in size from 24 to 100 or more pages, with numerous plates, mostly lithographic.

JOURNAL: Octavo; in numbers, one volume annually; illustrated. A popular record of the progress of the Museum, each number containing a Supplement which is a Guide Leaflet descriptive of some exhibit or group of exhibits in the Museum.

American Museum Journal

EDMUND O. HOVEY, *Editor*.

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THE HALL OF FOSSIL VERTEBRATES (GUIDE LEAFLET)	Supplement

AMERICAN MUSEUM OF NATURAL HISTORY

The Hall of Fossil Vertebrates



BY

W. D. Matthew, Ph.D.

Assistant Curator, Department of Vertebrate Palaeontology

SUPPLEMENT TO AMERICAN MUSEUM JOURNAL

VOL. II, No. 1, JANUARY, 1902

Guide Leaflet No. 3

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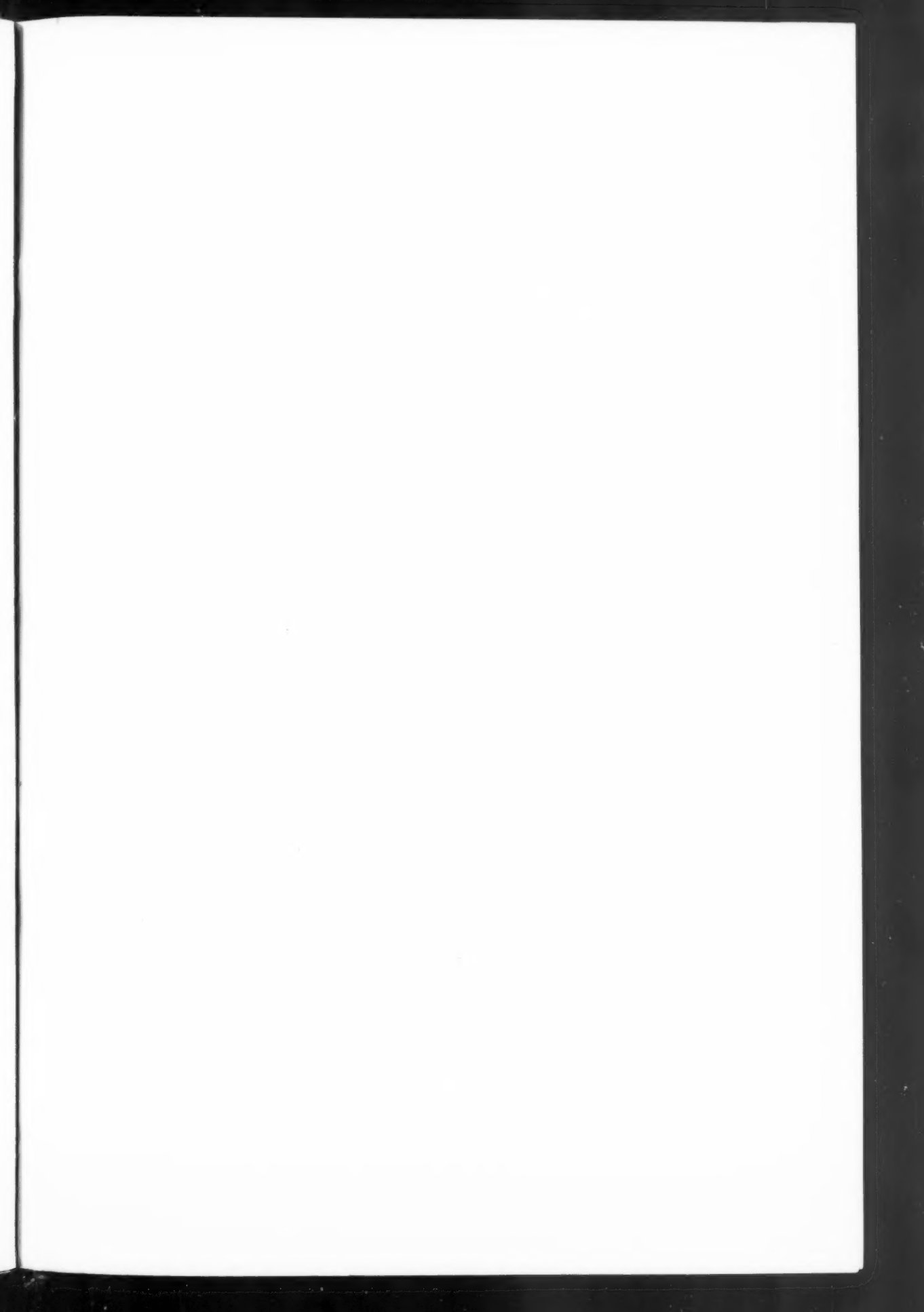
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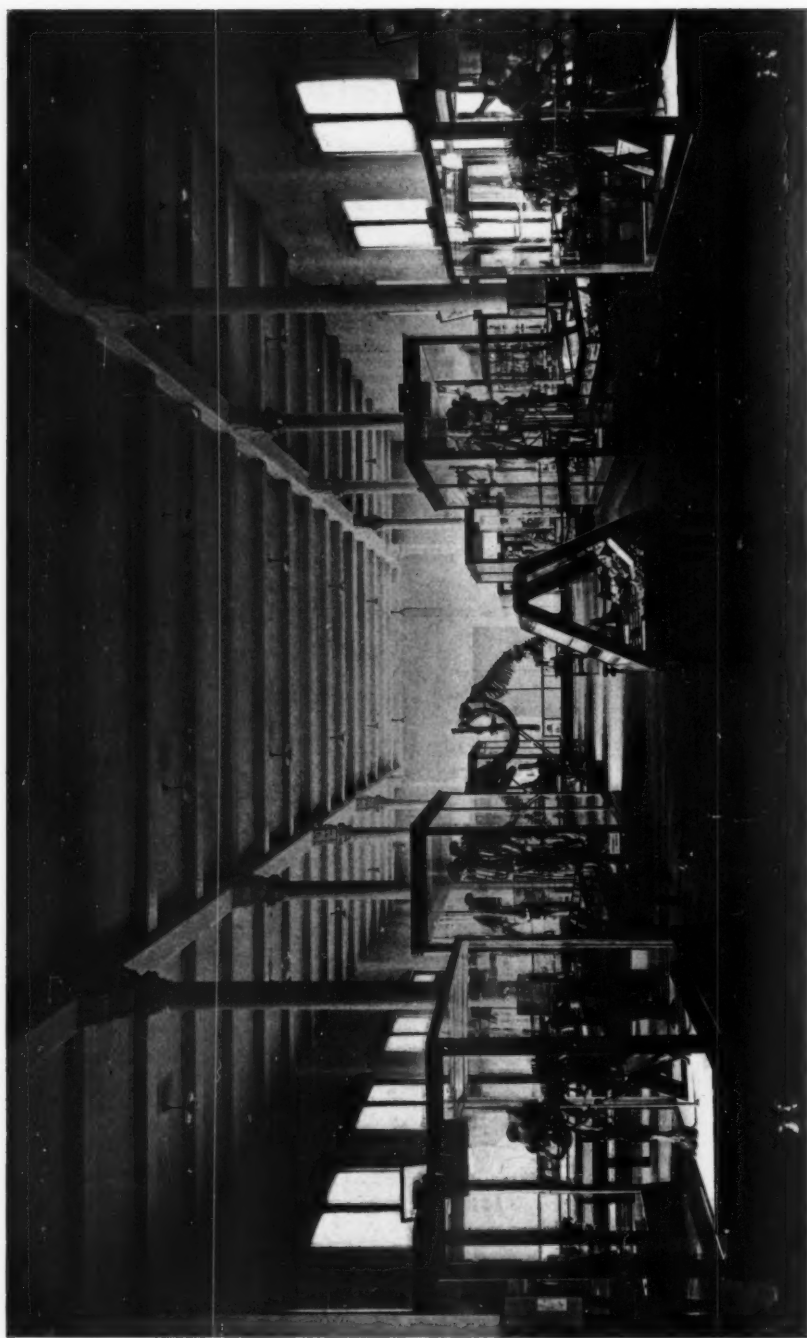
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THE HALL OF FOSSIL VERTEBRATES

THE HALL OF FOSSIL VERTEBRATES.

By W. D. MATTHEW, PH.D.,

Assistant Curator, Department of Vertebrate Palæontology.

INTRODUCTION.

WHEN we dig beneath the present surface of the ground we sometimes find remains of ancient cities, dwellings, bones of men and animals, buried many centuries ago under accumulations of debris, deposits of river mud or drifted sand. From these we learn many facts concerning the early history of mankind of which there is no written chronicle. From the study of these facts the science of Archæology has arisen, and it deals with the early history of mankind, with the evolution of civilization.

Most of the animals of which the archæologist finds traces are like those now living, although a few have become extinct. But in those more ancient deposits which are now consolidated into clays, sandstones etc., indications of man are not found, and the remains of animals which they contain are unlike any now living—the more unlike as the rock is more ancient. These remains are called *Fossils*. They consist only of the hard parts of animals (bones, shells, spines etc.). The soft parts are never preserved, and only very rarely is some trace of skin or hair, horns or hoofs, to be distinguished. As in the course of ages the mud or sand in which they are buried changes to rock, so little by little the fossils have been changed into a brittle, stony material, while retaining their outward form and usually their peculiar structure. But as mud and clay, in changing into rock, settle down and contract considerably, so also the fossils are flattened out to a corresponding extent—sometimes so much, in the case of a rock which has once been a soft oozy mud, that they suggest rather a picture or a bas-relief than the original form of the animal.

From fossils we can interpret the history of the world of life during the long ages before man appeared. The science which deals with the ancient history and evolution of the animal kingdom is Palæontology (παλᾱίος, ancient, ὄντα, living beings,

THE HALL OF FOSSIL VERTEBRATES

-λογία, science). It tells us of a long period of time before Man appeared, probably millions of years, during which Mammals of great size and unfamiliar form were the dominant animals—of a yet longer era before that, during which huge Reptiles were rulers of earth, sea and air—and of other more ancient periods during which Amphibians, Fish and Invertebrate animals held sway in turn. Vertebrate Palæontology deals only with the higher classes of fossil animals, the Vertebrata, or those that have backbones (fish, amphibians, reptiles, birds and mammals). For fossils of this kind the Bad-Lands of the Western States are the richest field, and from there came nearly all the specimens in this hall, the greater part of which have been found within the last ten years. The hall was opened in 1895.¹ At the time of writing, thirty complete skeletons of extinct animals have been placed on exhibition, besides many times that number of skulls, limbs and other imperfect specimens.

To give the visitor a clear idea of these extinct animals, the skeletons usually have been removed entirely from the rock in which they were found and have been mounted as much as possible like skeletons of modern animals; their probable appearance and habits are described by the labels and illustrated by water-color restorations. The especial interest of the hall lies in the fact that it shows so many of the data upon which are based the theories of Evolution. The arrangement of the specimens is intended to show the history or evolution of different races of animals, chiefly in North America. All the specimens of one race or kind of animal have been placed together, the most ancient first, the most recent last. All the skeletons in this hall are those of extinct animals.² The *Mastodon* and *Great Irish Deer* are half-petrified bone dug out of peat bogs. All the others are petrified (*i. e.*, they have been buried so long that they have been converted from bone into stone), and have been chiseled out of the solid rock. The *Megatherium* is a plaster cast, taken from bones from

¹ A brief history of the Department will be found in the number of this JOURNAL for November–December, 1901.

² Four small skeletons, those of the Raccoon, Cat, Opossum and young Lamb, have been placed in the cases near their extinct relatives, for comparison.

THE HALL OF FOSSIL VERTEBRATES

South America now in the museum of the Royal College of Surgeons, London. Some of the skeletons are partly restored in plaster, indicated by a red cross (restored bones) or red lines (outlines of restored parts of bones). Bones supplied from other specimens are marked with the catalogue number of the specimen or are indicated by a red circle, if uncatalogued.

GEOLOGICAL AGES AND PERIODS.

Cenozoic	Quaternary	Age of Man, 50,000 years
	Tertiary	Age of Mammals, 3,000,000 years
Mesozoic	Cretaceous	Age of Reptiles, 7,000,000 years
	Jurassic	
	Triassic	
Palæozoic	Permian	Age of Amphibians and Coal Plants, 5,000,000 years
	Carboniferous	Age of Fishes, 2,000,000 years
	Devonian	
	Silurian	
	Cambrian	Age of Invertebrates, 10,000,000 years
Eozoic	Algonkian	(No fossils)
	Archæan	

These estimates in years of the geological periods given in the accompanying table, which is arranged in descending order from the most recent to the most ancient time, must be understood to be merely very rough approximations. There is no known method of finding any exact equivalent in years of any geological period, although the relative length of each to each is

GEOLOGICAL FORMATIONS and CHARACTERISTIC ANIMALS.

THE AGE OF REPTILES PRECEDED THE AGE OF MAMMALS, AND IS REPRESENTED IN VARIOUS PARTS OF THE WORLD BY MARINE, LUTETARY AND FRESH-WATER DEPOSITS DIVIDED INTO THREE GREAT PERIODS, TRIASSIC, JURASSIC AND CRETACEOUS.

During this age the reptiles appeared flourished greatly, and declined at its close to their present importance. The mammals appeared well down in this age but remained small and scarce until its end.

	PERIODS	FORMATIONS	MEASUREMENTS	CHARACTERISTIC ANIMALS	
AGE OF REPTILES	EOCENE	TORREJON		MAMMALS IN LARGE NUMBERS TRUE LIZARDS and SPHENODONS ALLIGATORS and CROCODILES TURTLES NUMEROUS BONY FISHES (TELEOSTS)	
		PUERCO	800		
	CRETACEOUS	LARAMIE	1000 5000	CARNIVOROUS DINOSAURS HERBIVOROUS DINOSAURS HORNED HERBIVOROUS DINOSAURS LARGE PLESIOSAURS FIRST SOFT-SHELLED TURTLE BIRDS, TRIDACTYLUS (3-TOEDED) BIRDS, PRECISELY TOOTHED PTERODACTYLUS, TOOTHLESS MOSAOSAURS and PLESIOSAURS GIANTIC MARINE TURTLES DOLICHOSAURIAN LIZARDS SHARKS, CAT FISH, SPINOSAURS and BONY FISHES TOOTHED BIRDS, TOOTHLESS PTERODACTYLUS DINOSAURS	
		MONTANA	1200 8700	MOSAOSAURS and PLESIOSAURS LARGE MARINE TURTLES BONY FISHES (TELEOSTS) SHARKS GANOID FISHES.	
		COLORADO	1000 3000	MOSAOSAURS and PLESIOSAURS LARGE MARINE TURTLES BONY FISHES (TELEOSTS) SHARKS GANOID FISHES.	
		DAKOTA	400 5000	FIRST SNAKES TURTLES	
		COMANCHE	300 2500	TRUE LIZARDS and DOLICHOSAURS HERBIVOROUS DINOSAURS (MAMMALS) CARNIVOROUS DINOSAURS (MAMMALS) PTERODACTYLUS, TOOTHED and TOOTHLESS MOSAOSAURS ICHTHYOSAURS and PLESIOSAURS CROCODILES, TURTLES. SHARKS and GANOID FISHES CHIMÆROID FISHES	
		WEAVER POTOMAC			
		JURASSIC	SHARPS		PRIMITIVE MAMMALS (MAMMALS) CARNIVOROUS DINOSAURS (MAMMALS) HERBIVOROUS DINOSAURS (MAMMALS) TURTLES, PTERODACTYLUS FIRST BIRDS WITH TEETH (BIRDS) ICHTHYOSAURS (TOOTHED and TOOTHLESS) PLESIOSAURS, PTERODACTYLUS (TOOTHED)
			RICHMOND COAL BEDS and CONN and NEW JERSEY	1500 4800	SMALL PRIMITIVE MAMMALS LARGE BONY CHROMIS (TELEOSTS) ICHTHYOSAURS and PLESIOSAURS FIRST HERBIVOROUS DINOSAURS TURTLES, PTERODACTYLUS SHARKS and CHONDROSTEAL FISHES
TRIASSIC	SHARPS		PRIMITIVE MAMMALS (MAMMALS) TOOTHLESS, MICROSCOPIC FIRST CARNIVOROUS DINOSAURS LAST LABYRINTHOIDS PRIMITIVE CROCODILES (BIRDS) FIRST TURTLES and PTERODACTYLUS FIRST TELEOSTIC BONY FISHES SHARKS, CHONDROSTEAL and LUNG FISHES PLESIOSAURS (NOTHOSAURS) FIRST ICHTHYOSAURS (MIXOSAURS) PLACODONTS		
	RICHMOND COAL BEDS and CONN and NEW JERSEY	3000 6000	LARGE AMPHIBIANS (LABYRINTHOIDS) FIRST PLESIOSAURS (NOTHOSAURS)		
AGE OF AMPHIBIANS AND COAL PLANTS	PERMIAN		FIRST REPTILES (COILOSAURS, PROBOSAURS and PELYCOSAURS) PRIMITIVE AMPHIBIANS (STENOCEPHALIA) SHARKS, LUNG FISHES. CHONDROSTEAL and CHONDROPTERYGIAN FISHES		
	CARBONIFEROUS		PRIMITIVE AMPHIBIANS (STENOCEPHALIA), WITH SMALL SPECIES PRIMITIVE SNAKES and LUNG FISHES CHONDROSTEAL and CHONDROPTERYGIAN FISHES		

THE AGE OF MAMMALS

(CENOZOIC, OR TERTIARY AND QUATERNARY.)

WESTERN LAKE BASINS and CHARACTERISTIC MAMMALS

THE TERTIARY FORMATIONS ARE REPRESENTED IN WESTERN AMERICA BY A SERIES OF DEPOSITS FORMED ON THE BOTTOMS OF SUCCESSIVE FRESH WATER LAKES. THEIR TOTAL THICKNESS IS NEARLY 12000 FEET, REQUIRING PROBABLY TWO OR THREE MILLION YEARS TO FORM.

IN THE BEDIMENTS OF THESE LAKES WERE BURIED THE REMAINS OF MANY OF THE ANIMALS WHICH LIVED AROUND THEIR SHORES, LEAVING THUS A RECORD OF THE SUCCESSIVE SPECIES WHICH INHABITED THE LAKE REGION.

PERIODS	LAKE BASINS	THICKNESS	CHARACTERISTIC MAMMALS
RECENT AND PLEISTOCENE PLIOCENE	EQUUS AND MEGALONYX	150	ELEPHANTS, LAST MASTODONS
	BLANCO AND PALO DURO	150	LAST GROUND SLOTHS, LAST SABRE TOOTH TIGERS, CAMELS, ONE TOED HORSES, CAVE BEARS, PECCARIES, TAPIRS, DOGS, WOLVES, FOXES, CATS, DEER, FIRST PRONG HORN ANTELOPES
	LOUP FORK	400	GROUND SLOTHS, CAMELS, ONE TOED HORSES, FIRST TRUE HORSE, FIRST TRUE PRONG HORN ANTELOPE
	DEEP RIVER	150	MASTODONS, TRUE HORNLESS RHINOCEROSES, LAST OREODONT, CAMELS, THREE TOED HORSE, DEER, FIRST PRONG HORN ANTELOPE
			TRUE HORNLESS RHINOCEROSES, OREODONT, CAMELS, FIRST MASTODONS, FIRST TRUE HORSE
MIOCENE			
	JOHN DAY (OREGON, NEVADA)	1000	HORNLESS AND THIN HORNED RHINOCEROSES, LAST ELOTHERES, OREODONT, PRIMITIVE CAMELS, PRIMITIVE DEER, DOGS, CATS, WOLVES, FOXES, ETC., CATS, SABRE TOOTH TIGERS
OLIGOCENE			
	WHITE RIVER (NEV., S. DAK., N. DAK., COL., CANADA)	1000	HYPODAMIDS, PROTOCERAS, PECCARIES, LAST OREODONT, DOGS, CATS, WOLVES, FOXES, ETC., ELOTHERES, CURSORY RHINOCEROSES, TAPIRS, FIRST THREE TOED HORSES (MELORHIPPUS), SWIMMING RHINOCEROSES (AMPHODONT), LAST TITANOTHERES, OREODONT, PRIMITIVE DEER, FIRST TRUE HORNLESS RHINOCEROSES, PRIMITIVE DEER, LAST PRIMATES, RODENTS, INSECTIVORES
Eocene			
		800	PRIMITIVE RHINOCEROSES and AMPHODONT, TITANOTHERES, ELOTHERES, OREODONT, FIRST CAMEL, FIRST OREODONT, TAPIR, FOUR TOED HORSES, PRIMATES, RODENTS, LAST UNGUICULATED, DOG-LIKE CREODONT, MAMMALS
	BRIDGER (WYOMING, UTAH)	2000	UINGUICULATED, TITANOTHERES (HALOXYPS, TELLOSTHERES), PRIMITIVE RHINOCEROSES (MYRACORYS), FIRST ELOTHERES (ACHENODON), LARGE CREODONT (MESONYX), CAT-LIKE (PITHECULUS) and DOG-LIKE (MACHYCHONUS), FIRST SELENDONT, ARTIODACTYL (MORACODON), FOUR TOED HORSES (UROHIPPUS), LAST PRIMITIVE GROUND SLOTHS, PRIMATES, RODENTS, BATS, LAST TILLODONT
	WIND RIVER (WYOMING)	800	LAST CORYPHODONS, FIRST UINGUICULATED, FIRST TITANOTHERES, LAST CONDYLARTH, FOUR TOED HORSE, PROTOHIPPUS, PRIMATES, CREODONT, RODENTS, BATS, TILLODONT
AGE OF NEPTILES			
	WASATCH (WYOMING, NEW MEXICO)	2000	AMBLYPODS (CORYPHODON), CONDYLARTH (PHENACODON), FIRST FOUR TOED HORSES (MYRACORYTHUS), FIRST TAPIR (BYSTEMODON), FIRST ARTIODACTYL or DOG-LIKE HORSE (MAMMAL), PRIMATES (MONKEYS or LEMURS), CREODONT or PRIMITIVE CARNIVORE, (RESEMBLING CATS, DOGS and BEARS), FIRST RODENTS, TILLODONT, INSECTIVORE, PRIMITIVE GROUND SLOTHS
	TORREJON (NEW MEXICO)	300	CONDYLARTH PHENACODONT and AMBLYPOD, CREODONT, PRIMITIVE EDENTATE, FIRST PRIMATES, LAST MULTITUBerculata
CRETACEOUS	PUERCO (NEW MEXICO)	500	CONDYLARTH or PRIMITIVE MAMMAL, CREODONT or PRIMITIVE CARNIVORE, MULTITUBERCULATES (MONOTREMES), PRIMITIVE EDENTATES, GROUND SLOTHS
	LARAMIE	5000	

THE HALL OF FOSSIL VERTEBRATES

much more nearly known. The estimates given on page 5 are based on the very careful study of the subject made by C. D. Walcott, the present Director of the U. S. Geological Survey. In concluding his discussion Dr. Walcott stated his belief that the duration of geological time (the entire period included in this table) might be measured by tens of millions of years, but not by single millions or by hundreds of millions."

The most ancient of the extinct animals shown here are the creatures of the *Age of Reptiles*, such as the Dinosaurs, or great land reptiles, Mosasaurs, or great marine lizards, Ichthyosaurs, or fish-lizards, and other smaller animals. These are millions of years old. Some of the Dinosaurs are the largest known land



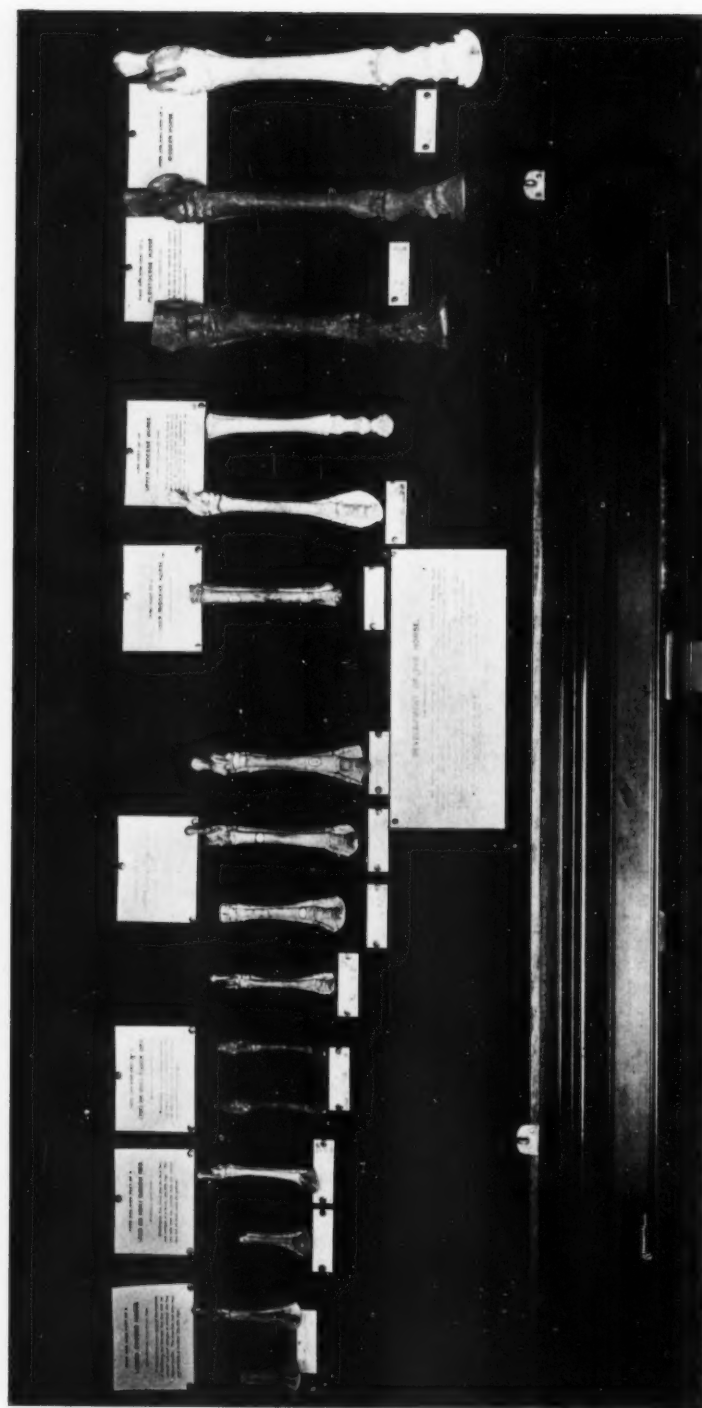
RESTORATION OF TITANOTHERIUM, AN EXTINCT HOOFED MAMMAL OF WESTERN AMERICA

The picture shows a bull, a cow and a calf

From the original watercolor, based on mounted skeleton and skulls in American Museum.

animals, longer than the width of the exhibition hall, and so tall that if they were standing on all fours their backs would reach within a few feet of the ceiling.

The greater part of the specimens are *Mammals*, or animals



EVOLUTION OF THE HORSE.—FEET

Photograph of the series of fore and hind feet in the American Museum, illustrating the Ancestry of the Horse

THE HALL OF FOSSIL VERTEBRATES

which suckle their young, including most four-footed beasts. Most of them lived during the Tertiary period, or *Age of Mammals*, and are hundreds of thousands of years old, ranging from perhaps three million years down; these lived long before man had appeared on the earth. A few, including the Mastodon, Mammoth, Megatherium, Irish Elk, One-toed Horse and others, are of the latest geological age, the Quaternary, or *Age of Man*, and, while tens of thousands of years old, were contemporaries of the earliest human beings.

Many of the extinct animals are allied to those which are still living and are called by the common names of their modern relatives. Thus we have extinct Horses, Rhinoceroses, Tapirs, Camels etc. Other races have died out completely and are not related to any living animals. *For these there is no popular name*, and we have to coin a name from their Latin or Greek scientific name, calling them "Titanotheres," "Dinosaurs" etc.

INSTANCES OF EVOLUTION.

The best example of the evolution of a race of animals is shown in the southeastern corner of the hall. Here is exhibited the *Ancestry of the Horse*, the specimens from successive geological strata showing how the Modern Horse has descended from diminutive ancestors with four toes on each forefoot and three on each hind foot, and with teeth and other parts of the skeleton different from those of their modern representatives.

Almost equally complete, although less familiar, is the series illustrating the *Ancestry of the Camel*, which may be found on the north side of the hall near the east end. These animals, like the Horses, evolved from small and primitive ancestors to large and highly specialized descendants, and then became extinct in their former home, the broad and arid plains of western America, before the advent of civilized man, but survived to modern times in other parts of the world. Less complete series are the skulls and skeletons illustrating the ancestors of Titanotheres and the ancestors of Rhinoceroses. These are ranged along the south side of the hall beginning at the entrance.

THE HALL OF FOSSIL VERTEBRATES

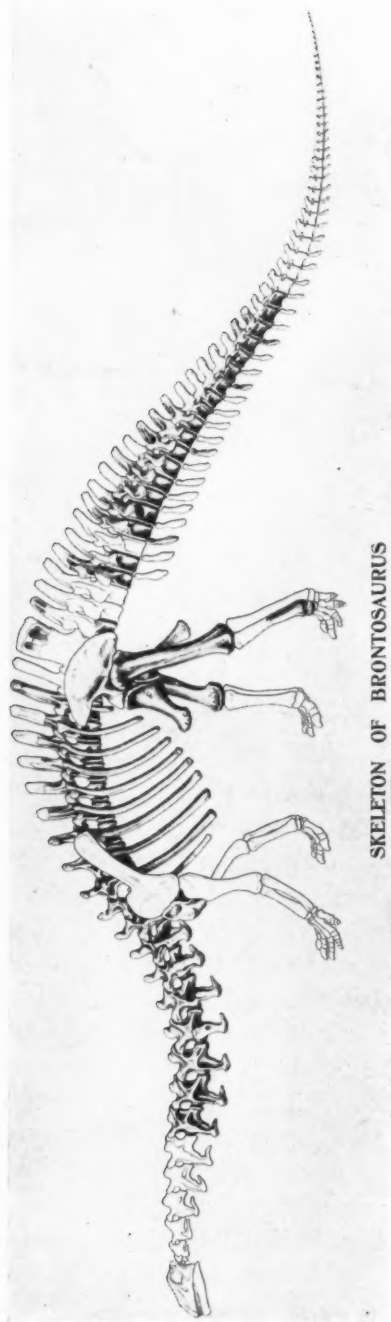
All these series have been placed according to geological age. The most ancient specimens, found in the lowest rock-strata, and hence representing the earliest stage of evolution, are placed first in the series. The most recent ones, found in the uppermost rock-strata, and representing the final stage of evolution of the race, are placed last. Arranging the species of a race from each stratum in the order of the age of the strata, we find that they show a regularly progressive change from the most ancient to the most recent. At no point in a given series can we draw a line and say: This is and that is not, a horse—or a camel—or a rhinoceros. The visitor, therefore, can demonstrate for himself the evolution of the race of Horses or Camels or Rhinoceroses, within certain limits. Of the evolution of Man we have no satisfactory illustration from fossils.

It should be observed that the evolution of a race consists mainly in the adaptation of the structure of the animals to particular surroundings and habits of life. There is also a universal progress in intelligence, the more ancient animals having relatively smaller brains than their successors.

ARRANGEMENT OF THE HALL.

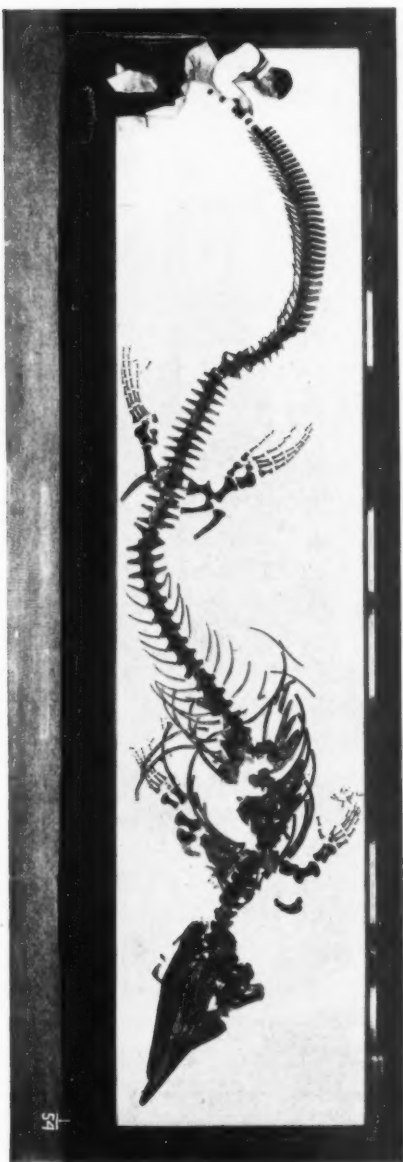
FOSSIL MAMMALS.

On the north side of the hall next the entrance are arranged the Amblypods, ancient hoofed animals long ago extinct, unlike any living animal, although suggesting elephants, rhinoceroses, hippopotami and bears in different parts of the body (skeletons of *Pantolambda* and *Coryphodon*, skulls of *Uintatherium*). Next to them are the Condylarths, the most ancient of Hoofed Mammals, chief among them the *Phenacodus* skeleton, well known to students and figured in most geological text-books as the prototype of the Hoofed Mammals. Next to these are the Carnivora, or flesh-eating mammals, of which four fine skeletons are placed in the large "A"-case. Then come the Insectivora, or insect-eaters, and Rodents, or gnawers, represented by small and incomplete specimens. Then the Elephants (*Mastodon* skeleton, skulls of mastodons and mammoths) and the various kinds of Artiodactyls, or Cloven-hoofed animals, which are allied to modern



SKELETON OF BRONTOSAURUS

RESTORATION OF THE SKELETON OF A DINOSAUR, OR GIANT REPTILE
Natural Size. Modified from restoration by Prof. O. C. Marsh
The shaded portions represent the bones preserved in specimen No. 460 of the American Museum collection



PHOTOGRAPH OF THE SKELETON OF THE GREAT MARINE LIZARD IN THE AMERICAN MUSEUM

THE HALL OF FOSSIL VERTEBRATES

pigs and peccaries, camels, deer, sheep and cattle. Four skeletons and numerous incomplete specimens represent these last.

The south side of the hall is devoted chiefly to the Perissodactyls or Odd-toed Hoofed Mammals. First come the Titanotheres, an extinct group, once abundant in North America, whose evolution is here illustrated by two skeletons and a series of skulls; then the Rhinoceroses, also abundant in North America in former geological epochs, represented here by six complete skeletons and a large series of skulls; after these the Horses, whose evolution is illustrated by two skeletons and many skulls and feet. At the eastern end of the hall is a cast of the skeleton of the *Megatherium*, or great Ground Sloth, the largest of a singular group of mammals which inhabited South America until the advent of Man in that part of the world.

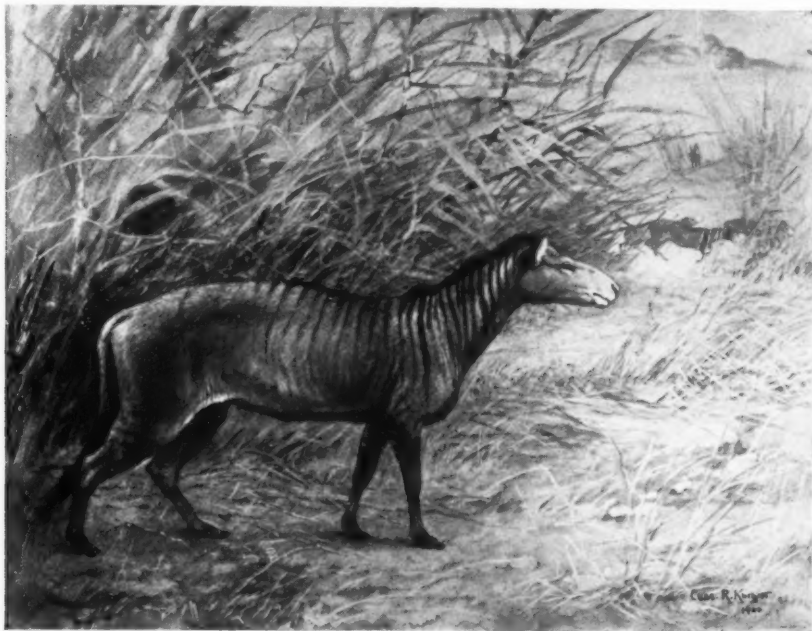
FOSSIL REPTILES.

The Dinosaurs, or giant reptiles, have been placed temporarily in two wall cases at the east end of the hall, and in the two high cases to the north of the centre aisle. Small models of restorations of three kinds of dinosaur will be found in an "A"-case near the east end of the hall, near the centre aisle.

These were the great terrestrial vertebrates of their day, the *Age of Reptiles*, and they assumed an extraordinary variety of forms, but all had long hind limbs and a long and massive tail. Some of the Sauropods (*e. g.*, *Brontosaurus*, *Diplodocus*, *Morosaurus*), four-footed, long-necked, herbivorous, probably amphibious, were beyond comparison the largest animals that ever trod the earth and can be compared in size only with the modern whales. Incomplete skeletons of these monstrous beasts are shown in this hall. Others, the Megalosaurs, were two-footed, carnivorous, preying on the clumsy giants (Sauropods) with which their remains are found associated in the rock. Others again, the Stegosaur and Ceratopsians, or armored dinosaurs, were short-necked quadrupeds, massively proportioned, with back and tail covered by heavy bony plates and spines. Another group, the Ornithopods or Iguanodonts, long-limbed bipeds—or rather tripeds, for the long and massive tail formed a third support,—

THE HALL OF FOSSIL VERTEBRATES

had broad, flattened, horny bills like some gigantic duck. The knowledge of these strange animals has been gained chiefly from fragmentary specimens and has been hindered not a little by the—to our eyes—strange and inappropriate combinations of form. It is only within the last few years that complete or nearly complete skeletons have been found, and the preparation for exhibition of those possessed by this Museum is not yet finished.



RESTORATION OF THE FOUR-TOED HORSE

Oldest known Ancestor of the Modern Horse; only 16 inches high
Photo from original watercolor by C. R. Knight, based on mounted skeleton in
American Museum

The *Mosasaurus*, or great marine lizards, are represented by the skeleton on the wall of the corridor by the staircase. Three *Ichthyosaurus* skeletons are placed on the opposite wall. This corridor will be filled ultimately with specimens of the great marine reptiles of the Mesozoic, or Age of Reptiles, which were in those times the tyrants of the sea, as the contemporary Dinosaurs were the giants of the land.

THE HALL OF FOSSIL VERTEBRATES

FOSSIL FISH.

In the corridor above the skeleton of the great Marine Lizard by the staircase will be found the skeleton of a great fish, obtained from the same geological stratum, and remotely allied to the Tarpon of the Florida coast.

ILLUSTRATING THE SPECIMENS.

The Watercolor Restorations by Charles R. Knight, done under the immediate supervision of Prof. Henry F. Osborn, the Curator of this Department, mainly based on complete skeletons



SCENE IN THE BAD LANDS OF THE UINTA BASIN—TERTIARY FOSSIL FIELD OF
NORTHEASTERN UTAH

exhibited in this hall, show the *probable appearance* of the different extinct animals, according to our best judgment, as indicated by the characters of the skeleton, appearance of their nearest sur-

THE HALL OF FOSSIL VERTEBRATES

viving relatives and the habits of life for which the animals seem to have been fitted. The general proportions of the animal, the outlines and form of head and body and, to a great extent, the expression of the features are usually accurately known from the fossil skeleton. The nature of the skin is sometimes but not often certainly known, and the coloring is always conjectural, the palæontologist and the artist having been guided by the coloring of living relatives and the supposed habits of the animal.

The Window Transparencies are enlargements from photographs of the regions where the fossils occur, and generally show the localities where unusually fine specimens in this hall were found. The Expeditions sent out yearly to the Fossil Fields carry with them a photographic outfit, and several hundred characteristic views have been taken, from which these have been selected. The Pillar Cards and general Labels in the cases give detailed information about each group of fossils. One of the cases in the centre of the middle aisle illustrates the method by which the fossils are collected and conveyed to the Museum. The Charts at each side of the entrance show the order in which the rock-strata lie, one over another, and the kinds of fossils found in each stratum.

American Museum of Natural History.

WHAT IT IS DOING FOR THE PUBLIC :

- Gives free admission to its halls on Wednesdays, Thursdays, Fridays, Saturdays and Sundays.
- Provides for free illustrated lectures on Tuesdays and Saturdays.
- Provides for free illustrated lectures to teachers on Saturdays.
- Provides instruction to school children when accompanied by teachers.

WHAT IT IS DOING FOR ITS MEMBERS :

- Gives free admission at all times.
- Provides special courses of illustrated lectures.
- Gives free use of Library.
- Issues the Journal.
- Distributes Guide Leaflets.

WHAT IT IS DOING FOR SCIENCE :

- Maintains exploring parties in various parts of the United States and in :
 - Siberia, British Columbia, Alaska, Peru,
 - China, Mexico, Bolivia, Central America.
- Maintains scientific publications :
 - Memoirs—eighteen numbers have been issued.
 - Bulletin—fifteen volumes have been issued.
 - Journal—one volume has been issued.

What the Museum Needs.

- Additional members.
- Increased subscriptions to defray expenses of exploring expeditions.
- Funds to make additional groups similar to those in the Bird, Mammal and Ethnology Halls.
- Small sums sufficient to preserve the records of the Indians of New York.
- Means for collecting and preserving representative examples of animals on the verge of extinction.
- Means for collecting fossils and geological specimens.

Membership Fees :

Annual Members,.....	\$ 10.
Life Members,.....	100.
Fellows,	500.
Patrons,.....	1,000.

All money received from membership fees is used for increasing the collections.

